

## **FOOTHILL TRANSPORTATION CORRIDOR – SOUTH GREENHOUSE GAS EMISSIONS/CARBON FOOTPRINT**

### **I. INTRODUCTION**

Global climate change is a change in the average weather of the earth, measured by wind patterns, storms, precipitation, and temperature. The increase in the average temperature of the earth over the last 100 years (global warming) may be natural temperature fluctuation; however, it is widely believed that the greenhouse effect has worsened over the last 50 years due to anthropogenic activities (California Climate Change Portal, 2005). Human activity is contributing to the temperature rise. Greenhouse gases, those gases that trap heat in the atmosphere, are emitted by natural processes and human activities, and are essential to regulating the earth's temperature. Greenhouse gases include water vapor, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), halogenated fluorocarbons (HCFCs), ozone (O<sub>3</sub>), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs). "Some of the heat flowing back toward space from the Earth's surface is absorbed by water vapor, carbon dioxide, ozone, and several other gases in the atmosphere and then reradiated back toward the Earth's surface. If the atmospheric concentrations of these greenhouse gases rise, the average temperature of the lower atmosphere will gradually increase." (Environmental Protection Agency, Glossary of Climate Change Terms, 2006).

Below is a summary of the Preferred Alternative's anticipated "carbon footprint," as requested by California Coastal Commission staff. Also discussed are greenhouse gas reduction strategies that are included as part of the Preferred Alternative (proposed project).

### **II. REGULATORY SETTING**

Executive Order (EO) S-3-05, signed by Governor Arnold Schwarzenegger on June 1, 2005, requires that the State of California reduce greenhouse gas emissions to 2000 levels by 2010, to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050.

The California Global Warming Solutions Act, Assembly Bill 32 (AB 32), was passed by the State legislature on August 31, 2006, and approved by the Governor on September 27, 2006. AB 32 requires the California Air Resources Board (ARB) to adopt regulations to require reporting and evaluation of statewide greenhouse gas emissions, and then to create a program and emission caps to limit statewide emissions to 1990 levels. This program is to be adopted by 2012 and implemented in a manner achieving emissions compliance by 2020.

Under AB 32, the ARB must identify significant sources or categories of sources of each greenhouse gas and establish protocols and procedures for monitoring, quantifying, and reporting the emissions by January 1, 2008. Next, ARB must issue a scoping plan to achieve emission reductions from specific sources or categories of sources by January 1, 2009. Finally, ARB must propose rules and caps for the sources by 2012. Until that time, the potential source characterization of, and significance

of emissions contributions related to, new infrastructure development will not be known, and numeric thresholds of significance cannot be established.

AB 32 does not directly amend other environmental laws, such as the California Environmental Quality Act (CEQA). Instead, it provides for creation of a greenhouse gas emissions program that will involve identification of sources, prioritization of sources for regulation based on significance of source contribution to greenhouse gas emissions, and eventual regulation of those sources. No guidance on preparing an impact assessment for global climate change and significance criteria for evaluating a development or infrastructure project has been developed.

### III. ANALYSIS CONSTRAINTS

Any analysis of global warming impacts is speculative in nature due to the lack of a direct link between a proposed infrastructure development project and global climate change. While vehicle emissions are a source of greenhouse gases, development/infrastructure does not cause vehicle emissions, though it may change emission patterns. The following bullet points outline the current difficulties in analyzing global warming impacts.

- AB 32 does not directly amend CEQA. Instead, it provides for creation of a greenhouse gas emissions program that will involve identification of sources, prioritization of sources for regulation based on significance of source contribution to greenhouse gas emissions, and eventual regulation of those sources.
- Under AB 32, ARB must identify significant sources or categories of sources of each greenhouse gas and establish protocols and procedures for monitoring, quantifying, and reporting the emissions by January 1, 2008. Next, the ARB must issue a scoping plan to achieve emission reductions from specific sources or categories of sources by January 1, 2009. Finally, ARB must propose rules and caps for the sources to become operative by 2012. Until that time, the potential source characterization of and significance of emissions contributions related to new infrastructure will not be known, and numeric thresholds of significance cannot be established.
- Factually, the carbon footprint of a roadway derives from a variety of sources. Some of those sources, such as transportation, are already subject to other requirements to achieve reductions in greenhouse gases. For example, California EO S-01-07, signed January 18, 2007, establishes a low carbon fuel standard with a statewide goal of reducing the carbon intensity of California's transportation fuels by at least 10 percent by 2020. The relationship of project impacts, as mitigated by compliance with current requirements and as-yet unestablished AB 32 reduction requirements, are not known.
- Direct impacts on climate change from a roadway are difficult to determine because infrastructure does not constitute a separate source of greenhouse gas emissions distinct from overall emissions in the area. Potential cumulative incremental climate change impacts related to urban development, including infrastructure, cannot be discerned with a high degree of certainty. The assessment of impacts incorporates many assumptions and generalized formulas. Impacts may be substantially overstated because of these limitations.
- In making CEQA findings, CEQA provides that an agency can find that a mitigation measure is "within the responsibility and jurisdiction of another public agency and have been, or can and should be, adopted by that other agency" (Public Resources Code section 21081(a)(2)).

Greenhouse gas emissions resulting from tailpipe emissions are not within the Transportation Corridor Agencies (TCA) jurisdiction, they are the responsibility of the State and federal government. Thus, there is an argument that mitigation of these impacts by TCA is not required.

- The California Climate Action Registry (CCAR) is authorized to establish methodologies to quantify greenhouse gas emissions (SB 1771 [Sher] 2000, and amended in 2001 by SB 527). CCAR publication “General Reporting Protocol, Version 2.2” (March 2007) limits calculations of greenhouse gas emissions to those operations or facilities owned or controlled by the entity responsible for the emissions (Part II, Chapter 2). This statutorily authorized methodology recognizes that an entity cannot be responsible for emissions that it does not control.

#### IV. METHODOLOGY

Direct impacts on climate change from a roadway are difficult to determine because infrastructure does not constitute a separate source of greenhouse gas emissions distinct from overall emissions in the area. In addition, it is difficult to measure or predict the magnitude of greenhouse gas emissions that might be associated with a particular project due to the indirect relationship between infrastructure and greenhouse gas production. As a result, project-specific contributions to global warming cannot be discerned with a high degree of certainty. However, the following discussion conservatively analyzes the Preferred Alternative’s construction phase impacts and long-term and operational impacts relative to greenhouse gas emissions in response to a question by California Coastal Commission staff. This document calculates, to the extent feasible, the project’s greenhouse gas emissions; and lists the Project Design Features (PDFs) incorporated into the project to avoid, minimize and reduce greenhouse gas emissions; and mitigation measures expected to achieve further reductions in vehicle miles traveled (VMT) and energy consumption, thereby further reducing greenhouse gas emissions.

Greenhouse gases include water vapor, CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HCFCs, PFCs, and HFCs. The proposed project is a transportation infrastructure project. Vehicular emissions include CO<sub>2</sub> and water vapor; however, only CO<sub>2</sub> emissions are included in the Emission Factors (EMFAC) air quality model. Since there is no established methodology for calculating water vapor emissions for the Preferred Alternative, project emissions of water vapor have not been estimated. CO<sub>2</sub> emissions can be calculated using the EMFAC model and are provided below. Emissions of O<sub>3</sub> precursors, NO<sub>x</sub> and volatile organic compounds (VOCs), have also been estimated for the project and are included in the air quality analyses in the Final Supplemental Environmental Impact Report (SEIR) (December, 2005). O<sub>3</sub> is relatively short-lived in the troposphere and therefore is not global in nature. There is insufficient information at this time to make an accurate determination of the contribution of O<sub>3</sub> precursors to global warming; therefore, it is assumed that project emissions of O<sub>3</sub> precursors would not significantly contribute to global climate change.

HCFCs, O<sub>3</sub>, PFCs, and HFCs are found in consumer products such as older refrigeration units, older vehicular air conditioning units, and aerosol propellants. These fluorocarbons are not tailpipe emissions. Similarly, CH<sub>4</sub> is not a vehicular tailpipe emission and is more typically associated with dairy farms (fermentation of manure) and decaying organic materials occurring naturally such as in natural gas fields, or as a result of landfills. N<sub>2</sub>O is produced by microbial processes in soil and water, including reactions that occur in fertilizer containing nitrogen. Therefore, N<sub>2</sub>O emissions are associated with agricultural sources, some industrial processes that use fossil fuels, and in engines

that use it as an aerosol spray propellant. The Preferred Alternative will not result in emissions of fluorochemicals, CH<sub>4</sub>, or N<sub>2</sub>O.

CO<sub>2</sub> emissions associated with the vehicular traffic that will use the proposed project were calculated using the EMFAC air quality model. CO<sub>2</sub> within the project region was calculated using the traffic data from Appendix B of the Traffic and Circulation Technical Report (Austin-Foust Associates, Inc., December 2003) and the EMFAC2007 emission factor model. The average vehicle speed within the region was calculated for each alternative and each baseline condition by dividing the vehicle miles traveled (VMT) by the vehicle hours traveled (VHT). The average vehicle speed for the baseline and with project conditions for the Preferred Alternative is shown in Table A. These average vehicle speeds, along with the VMT and the EMFAC2007 CO<sub>2</sub> emission rates, were used to calculate the regionwide CO<sub>2</sub> emissions.

## V. CARBON FOOTPRINT ASSESSMENT

### Long-Term Emissions

The following discussion analyzes the proposed project's potential long-term operational impacts on greenhouse gas emissions. The primary source of greenhouse gas emissions resulting from a transportation project is vehicle emissions. Therefore, the following analysis discusses the change in VMT, VHT, and CO<sub>2</sub> emissions resulting from operation of the Preferred Alternative.

As part of the traffic analysis for the proposed project, the changes in the 2025 regionwide VMT and VHT produced by the Preferred Alternative compared to the No Action Alternative were estimated (Table A). The changes in systemwide VMT for the Preferred Alternative were found to be relatively low, which is an indication that the average length of vehicle trips does not change substantially, in terms of distance, between the No Action Alternative and the Preferred Alternative.

**Table A: CO<sub>2</sub> Emission for the Preferred Alternative in Comparison to Baseline Emissions**

	Baseline	Preferred Alternative
<b>VMT</b>	421,794,107	421,795,693
<b>VHT</b>	12,805,181	12,773,601
<b>Average Speed</b>	32.94	33.02
<b>CO<sub>2</sub> Rate</b>	446.18	445.57
<b>Emissions (lb/day)</b>	414,907,294.25	414,338,744.64
<b>CO<sub>2</sub> Increase</b>	-568,549.60	
<b>% CO<sub>2</sub> Reduction</b>	0.137	

The VHT statistic is an indicator of the travel time savings produced due to the traffic congestion relief provided by the Preferred Alternative. This travel time savings statistic is expressed as total hours of reduced vehicle travel time per day. The Preferred Alternative is anticipated to result in a vehicle travel time savings of 32,000 hours per day.

The Preferred Alternative results in more vehicles traveling at a higher speed than with the corresponding No Action Alternatives. The increase in the VMT increases vehicle emissions;

however, reduction of congestion and an increase in traveling speed decreases vehicle emissions. The combination of these two factors results in a reduction in CO<sub>2</sub> emissions anticipated during the long-term operation of the Preferred Alternative. As shown in Table A, the Preferred Alternative is anticipated to result in a decrease in CO<sub>2</sub> emissions generated within the region, compared with baseline conditions (future conditions without the project). The net reduction is relatively small as a percentage of emissions generated within the region (0.137 percent) compared with baseline conditions; however, the actual emissions reduction of over 568,000 pounds per day is a notable benefit.

### **Short-Term Construction Impacts**

The Preferred Alternative will result in short-term emissions during construction. Air pollutants, including greenhouse gases, will be emitted by construction equipment. As discussed below, the Preferred Alternative incorporates mitigation measures that require compliance with Air Quality Management District rules and policies (including Rules 401, 402, and 403), and grading code and construction air quality policies. These mitigation measures will limit idling and construction equipment emissions, require the use of ARB-certified equipment of post-combustion controls, and compliance with State construction vehicle emission standards. Other measures require the use of and proper maintenance of low-emission mobile construction equipment and require that work crews shut off equipment when not in use to reduce emissions.

## **VI. PROJECT DESIGN FEATURES AND MITIGATION MEASURES**

### **State Strategies**

The California Environmental Protection Agency's *Climate Action Team Report to Governor Schwarzenegger and the Legislature* (March 2006) proposed a path to achieve the Governor's greenhouse gas reduction targets. This report recommended several strategies to reduce greenhouse gas emissions. Projects can implement these strategies by incorporating design features such as vehicle trip reduction strategies, providing multimodal transportation options, increasing energy efficiency beyond Title 24 requirements, increased recycling, and incorporating green building technology. Strategies that would reduce transportation related or energy use emissions include:

- **Vehicle Climate Change Standards and other Light Duty Vehicle Technology:** These are ARB-enforced standards; as these standards are developed and implemented, an increasing number of the vehicles that access the project will comply with the strategy.
- **Diesel Anti-Idling:** Signs posted that restrict idling; on-site education for truck drivers regarding health impacts of diesel.
- **HFC Reduction:** This measure applies to consumer products. When the ARB adopts regulations for these reduction measures, an increasing number of products will comply with the measures.
- **Transportation Refrigeration Units (TRU), Off-Road Electrification, Port Electrification:** In projects where TRUs access the site, implement measures to reduce emissions; install electrification in applicable projects (i.e., truck stops, warehouses).

- Heavy-Duty Vehicle Emission Reduction Measures: These are ARB-enforced standards; as applicable, vehicles that access the project will comply with the strategy.
- Water Use Efficiency: Features to increase water use efficiency include use of both potable and non-potable water to the maximum extent practicable; low-flow appliances (i.e., toilets, dishwashers, washing machines, etc.); automatic shut off valves for sinks in restrooms; drought-resistant landscaping; “Save Water” signs near water faucets.

### **Project Specific-Mitigation and Design Features**

The proposed project will have a beneficial cumulative effect on reducing greenhouse gas emissions. Although no further mitigation measures are necessary, the following mitigation measures and project design features have been incorporated into the proposed project and comply with the strategies presented in the *Climate Action Team Report to Governor Schwarzenegger and the Legislature*.

- Compliance with outdoor lighting codes designed to reduce energy and output:
  - Measure AS-3 requires that lighting be installed per Caltrans policies and procedures as set forth in the Caltrans Traffic Manual. The mainline corridor will not be continuously lit, which will reduce energy and output.
  - Measure AS-4 specifies that light will be applied as effectively as possible to minimize both the glare of any light source and the spillover of light onto areas outside of the corridor right-of-way.
  - PDF 18-1 specifies that the Preferred Alternative will include pole-mounted lighting at the toll plazas, ramps, and other locations as required by Caltrans standards. Lighting in areas away from the toll plazas, ramps, and other locations as required by Caltrans standards will be minimized to avoid unnecessary light effects in more rural areas adjacent to the corridor. In addition, all lighting along the corridors will be shielded and directed to focus the light on the corridor and its facilities to minimize light leakage outside the corridor limits.
- Water conservation measures, including incorporation of drought-resistant landscaping materials:
  - Measure WV-7 specifies that the landscaping along the corridor in open space (nonurban) areas will be a mix of native, noninvasive, drought-tolerant plant species from the scrub, grassland, and chaparral communities.
  - Measure WV-7 also specifies that during plant establishment, temporary low-volume irrigation systems using reclaimed water (where available) shall be included in the final design of the selected alternative.
  - PDF 8-2 specifies that the Preferred Alternative will include landscaping for unpaved areas within the corridor rights-of-way. Landscaping will focus on native plant species, particularly in areas adjacent to undeveloped land with native plant species.
- Preparation and implementation of Transportation Management Plans to reduce VMT:
  - Measure CT-1 includes preparation and implementation of a Construction Traffic Management Plan to reduce construction vehicle traffic and to minimize traffic flow interference from construction activities.

- Compliance with Air Quality Management District rules and policies (including Rules 401, 402, and 403) and grading code and construction air quality policies designed to limit idling and limit construction equipment emissions, including ozone precursor emission controls, preparation of diesel emission reduction plans, requirements for the use of ARB-certified equipment of post-combustion controls, and compliance with state construction vehicle emission standards.
  - Measures AQ-1, AQ-2, and AQ-5 require compliance with Air Quality Management District rules and policies (including Rules 401, 402, and 403) and grading code and construction air quality policies designed to limit idling and limit construction equipment emissions, including ozone precursor emission controls, requirements for the use of ARB-certified equipment, and compliance with State construction vehicle emission standards.
  - Measure AQ-5 requires the use of and proper maintenance of low-emission mobile construction equipment to reduce emissions. This measure also requires that work crews shut off equipment when not in use.
  - Measure AQ-5 requires that the contractor support incentives for ridesharing and transit use by the construction crew.

## VII. CONCLUSION

Implementation of FTC-S will result in a reduction in emissions of CO<sub>2</sub>, largely as a result of improved travel speeds in the region. This reduction in emissions of CO<sub>2</sub>, a greenhouse gas, is consistent with the objectives of AB 32 to reduce greenhouse gas emissions in California. Further, the proposed project includes design features to require energy efficiency lighting, conserve water, and reduce construction equipment emissions. Therefore, the Preferred Alternative, when combined with the results of other greenhouse gas reduction efforts anticipated to occur as mandated by AB 32 and other legislation, is expected to have a beneficial cumulative effect of reducing greenhouse gas emissions.